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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/583,640	06/20/2006	Koen De Keersmaecker	IMEC320.001APC	3620
20995 7590 10/21/2011 KNOBBE MARTENS OLSON & BEAR LLP 2040 MAIN STREET FOURTEENTH FLOOR IRVINE, CA 92614				
EXAMINER SAKELARIS, SALLY A				
ART UNIT		PAPER NUMBER		
1773				
NOTIFICATION DATE		DELIVERY MODE		
10/21/2011		ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary**Application No.**

10/583,640

Applicant(s)

KEERSMAECKER ET AL.

Examiner

SALLY SAKELARIS

Art Unit

1773

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 9/2/2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 21-32, 41, 50-52 and 54-62 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 21-32, 41, 50-52 and 54-62 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-CB06)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____
- Paper No(s)/Mail Date ____

DETAILED ACTION

Response to Amendment

The amendment filed 9/2/2011 has been received and considered for examination. Claims 21-32, 41, 50-52, 54-62, and new claims 63-69 remain pending.

Newly submitted claims 63-69 are each directed to a species that is independent or distinct from the invention originally claimed for the following reasons: The requirements for an ohmic contact, diode-like contact, isolating configuration, passivating configuration, cushioning configuration, binding sites, and silane immobilized anchoring layer each represent a new structure not found in the group of claims elected in the original restriction requirement. The applicant may leave the claims as withdrawn and if allowable subject matter is found within the independent claim the withdrawn claims dependent therefrom will be rejoined. However, further search and examination of these new claims causes a burden on the examiner.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 63-69 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 60-61 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 60 recites that “the floating gate” in its last line. There is insufficient antecedent basis for this limitation in the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

I. Claims 21-32, 41, and 50-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yousaf et al.(PNAS, 2001) in view of Hollis et al. (US 5653,939) and in further view Robinson (6078070).

With regard to claim 21, Yousaf et al. teach a sensing device for sensing a specific binding between an analyte and a recognition molecule, the sensing device comprising: a patterned, localized, and individually addressable microelectronic sensor comprising an individually addressable activation element and a plurality of self-aligned recognition molecules (i.e., the monolayer is interpreted as being self-aligned, localized, and individually addressable in the absence of any structural requirements for these components see Figure 1) micro-electronically addressable sensor surface (ie anchoring layer), the sensor surface comprising a recognition molecule (self-assembled monolayer (SAM) of alkanethiolates) and an activation element (i.e., electrical potential) which is a thermal or electrochemical activation element, wherein the activation element is configured to activate the sensor surface by heating or adjusting an oxidation state of a part of the anchoring layer through an applied voltage or current, wherein the recognition molecule (i.e., monolayer featured in Figure 2) is covalently bound to the sensor surface (i.e., Au and Sulfur of the monolayer), and wherein the sensor is capable of electrochemically detecting a specific binding between the recognition molecules and an analyte as can be seen in the electrochemical teachings on page 5993 (1st ¶ and Rt column 2nd ¶).

With regard to claim 22, Yousaf et al. teach that a cyclic voltammetry was performed with a Bio-analytical Systems (CV-50 potentiostat by using the gold/SAM as the working electrode, platinum wire as the counter electrode, and Ag/AgCl as the reference electrode (Materials and Methods, Electrochemistry, Pg.5993).

With regard to claims 23 and 24, Yousaf et al. teach that each of the plurality of patterned, localized micro-electronically addressable sensors are individually activatable and addressable (i.e., via application of electrical potential and subsequent Diels Alder mediated immobilization of peptide on right of Figure 2 and Figure 1 for teaching of patterned and localized).

With regard to claims 25 and 26, Yousaf et al. teach that the sensor surface includes a chemical molecule based, SAM anchoring layer (Figure 2) covalently bonded to the gold substrate.

With regard to claim 27, Yousaf et al. teach that the SAM anchoring layer is activatable via an application of an electrical potential of 500mV (figure 2).

With regard to claims 28 and 29, Yousaf et al. teach that the electric potential based activation element converts the once inert monolayer (SAM) to a monolayer presenting the corresponding quinine groups which ultimately results in their Diels-Alder mediated immobilization of peptides (Furthest right in Figure 2).

With regard to claim 30, Yousaf et al. teach that the material is gold which is a transition metal.

With regard to claims 31 and 32, Yousaf et al. teach that the thermal activation element is a potentiostat (CV-50) which includes a resistor.

With regard to claim 41, Yousaf et al. teach that their device is a microelectronic chip considering it operates using micro-scaled features that rely on electronic conductance (Fig.1).

With regard to claim 50, Yousaf et al. teach a method for electrochemically detecting (Page 5993 1st ¶ and Rt column 2nd ¶), a binding event, the method comprising: providing a sensing device according to claim 21 as can be seen above, activating the sensor surface; depositing a recognition molecule from a liquid phase or a vapor phase onto the sensor surface (see above rejection for claims 21-32); and detecting a binding event between the recognition molecule and an analyte (i.e., detection was measured by scanning electron micrograph and via fluorescence microscopy (Figures 3-5 page 5995)).

With regard to claims 21 and 50-59, Yousaf et al. does not teach that the part of the anchoring layer that is either heated or cooled or the exact size of this area.

Hollis et al. teaches the use of embedded resistors (32) described in connection with FIGS. 1 and 4 to locally heat predetermined array test sites without substantially heating adjacent sites (Col. 13 lines 50-60). Furthermore, Hollis et al. teaches that about 7+million test sites can be fabricated and tested on a single 3 in. Silicon wafer using the state of technology at the time when this patent was issued.

At the time the invention was made it would have been obvious to a person of skill in the art to have incorporated the regions and heaters sized as taught by Hollis et al. into the device of Yousaf et al. as the ability to affect multiple changes in the bioactivity of a substrate will be especially useful in studies of heterotypic cell-cell interactions where the fate of a given cell depends on the identities and periods of exposure to neighboring cells. Such dynamic substrate would also prove useful in microfluidic lab-on-a-chip systems by allowing active use of channels

to process analytes in a sample. In addition Hollis provides that the heating of each selected region results in the ability to deprotect (revealing free -OH groups) at selected locations making the addition of nucleic acid bases a more specific venture (Col. 12).

Neither Yousaf or Hollis teach an individually addressable activation element (i.e., a FET atop the bottom auxiliary layer and a top auxiliary layer atop the individual addressable activation element).

Robinson teaches a phototransistor illustrated in FIG. 2 is created from a typical FET structure grown above an AlAs layer above a semi-insulating GaAs substrate. A MESFET is then fabricated using conventional procedures, such as described with reference to FIG. 1. The MESFET is then flipped upside-down and bonded, gate side down, using a thermally-conductive and electrically-insulative high temperature epoxy 32, onto an arbitrary substrate 36 such as aluminum nitride (AlN), aluminum oxide (Al₂O₃), sapphire, etc. The GaAs semi-insulating substrate 38 is lapped to a thickness of approximately 100 microns. The remaining GaAs is removed, stopping at the AlAs layer 40, using reactive ion etching ("RIE") with Freon 12, CCl₂F₂, or equivalent, etchant gas. As a result of the flipping, the backside of the fabricated MESFET is exposed. An active layer mesa from the GaAs substrate remains in the center of the exposed backside after the RIE treatment. A Schottky barrier gate 42 consisting of Ti, Pt, and Au, is thus positioned below the thin (approx. 15 micron) active layer 38 of GaAs. The gate 42 and the source and drain ohmic contacts 44, 46 to the n+ GaAs 48 are below the gate.

It would have been obvious to create the structure of FET gate as taught by Robinson within the device of Yousaf in view of Hollis as Robinson provides that this MESFET works

without degradation to 250C and has a high degree of light sensitivity because most of the thin exposed backside over the gate is removed providing a phototransistor that avoids some of the shortcomings of conventional GaAs MESFETs (Col. 2 lines 1-25).

2. Claims 60-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yousaf et al.(PNAS, 2001) in view Hollis et al. (US 5653939) and in further view Robinson (6078070) and in an even further view of Shin et al. (Applied Surface Science 214(2003) 214-221).

The teachings of Yousaf in view of Hollis et al. and in further view of Robinson can be seen above.

With respect to claim 63, Yousaf et al. teach the use of hydroquinone-terminated alkanethiol (HQ) and penta (ethylene glycol) terminated alkanethiol (EG5OH) to install the electroactive monolayer in the nonprinted regions.

Yousaf in view of Hollis et al. and Robinson do not teach an ISFET or the use of Ta2O5.

Shin et al. teach tantalum pentoxide for use as the pH sensitive layer for ISFET (Introduction page 214).

It would have been obvious to a person of skill in the art at the time the invention was made to have include the ISFET and Ta2O5 of Shin into the device of Yousaf in view of Hollis and Robinson as Shin teaches that Ta2O5 shows the best pH sensitive properties in terms of sensitively and stability making it a superior choice for cost, efficiency and resource savings.

Furthermore, it is well known that it is obvious to combine prior art elements according to known methods to yield predictable results.

Response to Arguments

Applicant's arguments with respect to claims 21-32 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SALLY SAKELARIS whose telephone number is (571)272-6297. The examiner can normally be reached on Monday-Friday 8-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 5712721267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Sally A Sakelaris/
Primary Examiner, Art Unit 1773
10/14/2011